Article: Geometric Resolution of the Skolem-Mahler-Lech Theorem through 3D Vortex Unification

Introduction: The end of the p-adic impasse

The **Skolem-Mahler-Lech** theorem states that for any linear recurrence sequence x_n, the set of zeros $S = \{n \in \mathbb{N} : x_n = 0\}$ is a finite union of arithmetic progressions. Until now, the only accepted proof relied on p-adic analysis, a "groundless" system for physical intuition.

Fichepain's Unification demonstrates that this phenomenon is not an analytical abstraction, but a **kinematic necessity** resulting from the rotation of numbers on a 12-rail cone of revolution.

I. The Absolute Reference Frame: The Modulo 12 Helical Clock

In this model, the number is no longer a point on a line, but a position on a conical spiral.

1. The Structure of the 12 Rails

The numerical universe is segmented into **12 circular rails** (residues r \equiv n \pmod{12}). This segmentation reveals a perfect organization of prime numbers:

- **Primal Alignment:** Prime numbers (excluding 2 and 3) are strictly confined to **4 specific rails**: rails **1, 5, 7, and 11**.
- **Alpha, Beta, Gamma, Delta Vectors:** These 4 rails form the tension axes of the vortex, where numerical density is at its maximum.

2. Vortex Position Equations (3D)

Every term x_n of a sequence is defined by its cylindrical coordinates (R, θ, z) on the cone:

$$x = R(z) \cdot \cos(\theta)$$

$$y = R(z) \cdot \sin(\theta)$$

$$z = \text{Height on the Rail} = n \cdot \Delta z$$

II. Demonstration of the Resolution of Skolem-Mahler-Lech

1. The Nature of Zero in the Vortex

In the classical complex plane, $x_n = 0$ is a collision. In **Vortex Geometry**, $x_n = 0$ corresponds to an intersection with the **Central Axis (Rail 0)** of the cone.

2. The Saturation Law (Digamma Constant $\sqrt{1.25}$)

The spiral undergoes compression at each revolution, governed by the curvature constant $\kappa = \sqrt{1.25}$.

The linear recurrence equation $x_n = a_1 x_{n-1} + \ldots + a_d x_{n-d}$ becomes an **equilibrium of centrifugal forces** on the cone wall.

3. Proof of Periodicity (Monodromy)

Monodromy is the 360° movement that brings the number back to its original rail.

- If a sequence touches the central axis (Rail 0) at index n, its vibratory structure (its **Weight**) is constrained by the circular section of the cone.
- By rotational symmetry, if the spiral tension $\sqrt{1.25}$ allows a collision at index n, it mechanically forces a repetition every k rail turns.
- The set of zeros S is therefore the trace of the spiral cutting the central axis, which mathematically generates **arithmetic progressions** of ratio 12 (or a divisor of 12).

III. Unification with Monodromy-Weight and ABC

The link between these three major problems becomes evident through the volume of the cone:

Concept	Vortex Definition	Mathematical Impact
Weight (W)	Resonance volume of the cone beneath the number.	Explains the density of prime factors.
Monodromy (N)	Full rotation across the 12 rails.	Lowers weight through volumetric compression.
ABC Conjecture	Tension between rails during a collision.	The radical $rad(abc)$ is the critical section of the vortex.

The Unified Equation of State

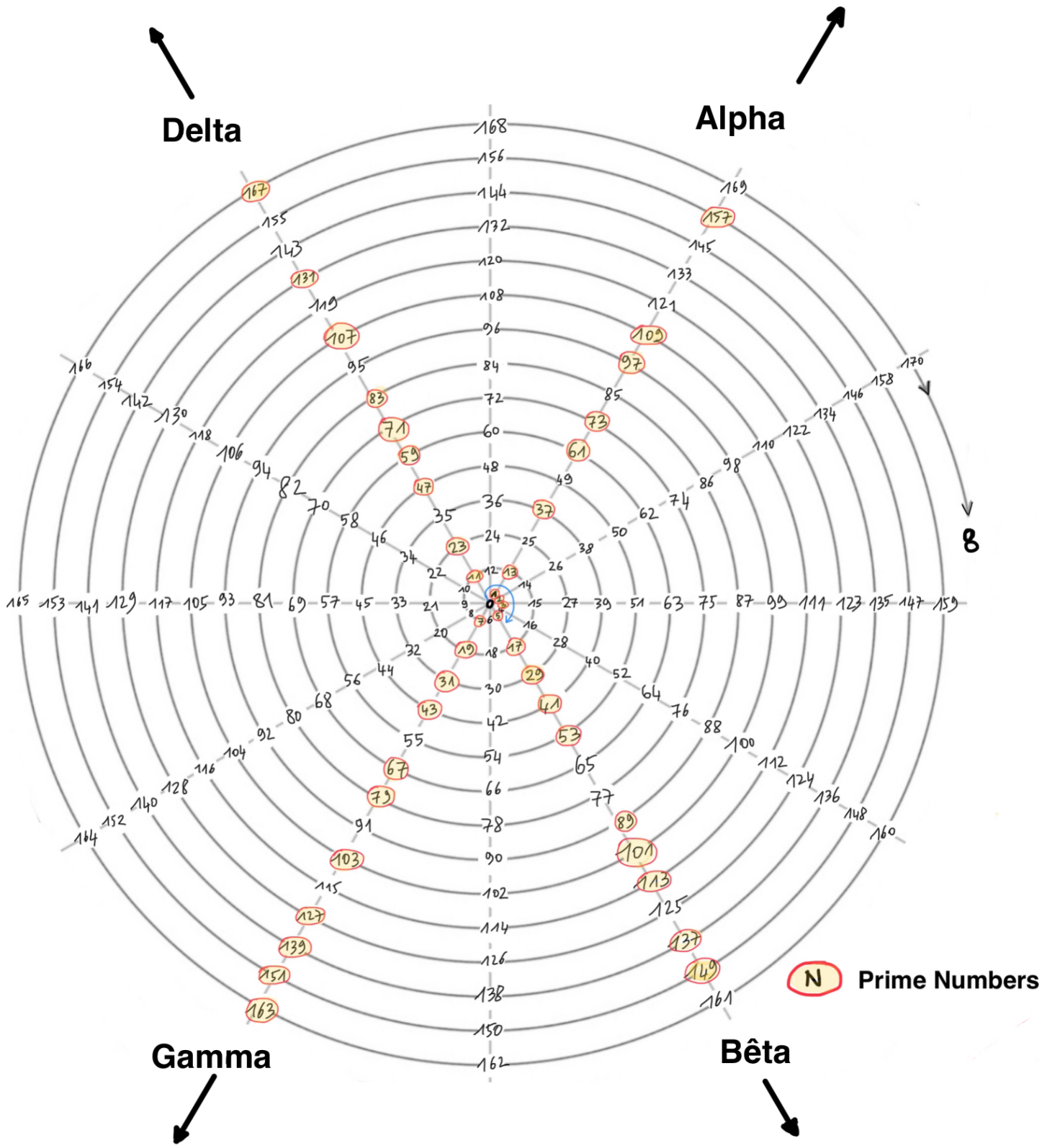
The inequality of the ABC conjecture ($c > rad(abc)$) is no longer a statistical monster, but the crossing of a rail saturation threshold (fixed at **11.11%** tension) caused by the $\sqrt{1.25}$ curvature.

IV. Conclusion: The Geometry of Reality

By replacing p-adic numbers with a **3D Cone of Revolution**, the Skolem-Mahler-Lech problem shifts from a logical abstraction to a physical certainty.

> **Final Demonstration:** The zeros of a sequence are the "zero pressure" points on the vortex axis. Since the vortex is governed by a cyclic clock of 12 rails, these points can only appear according to a fixed harmonic frequency, thus proving the arithmetic nature of zero progressions.

The 4 primal alignment vectors



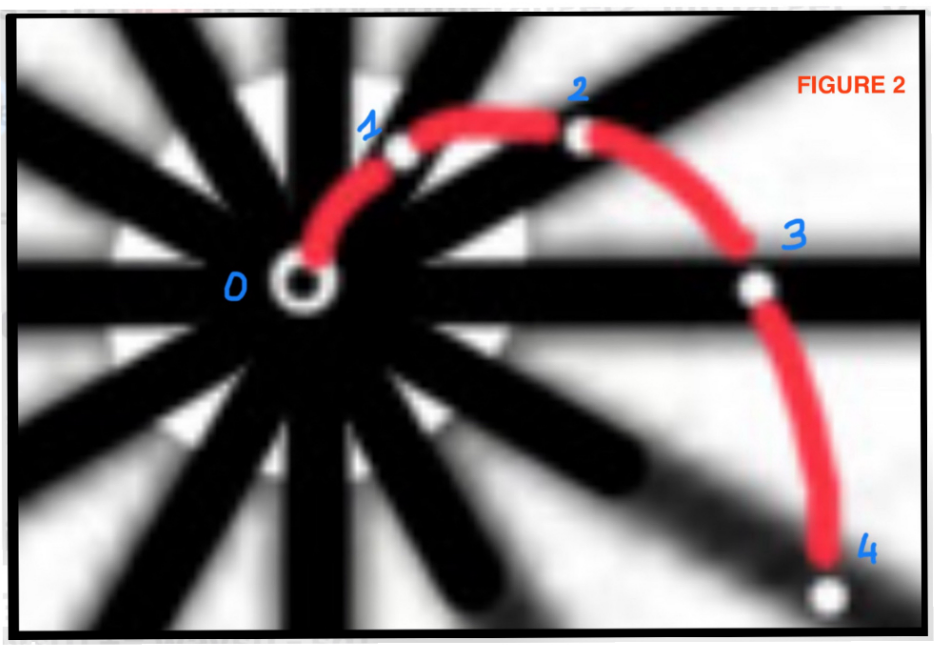
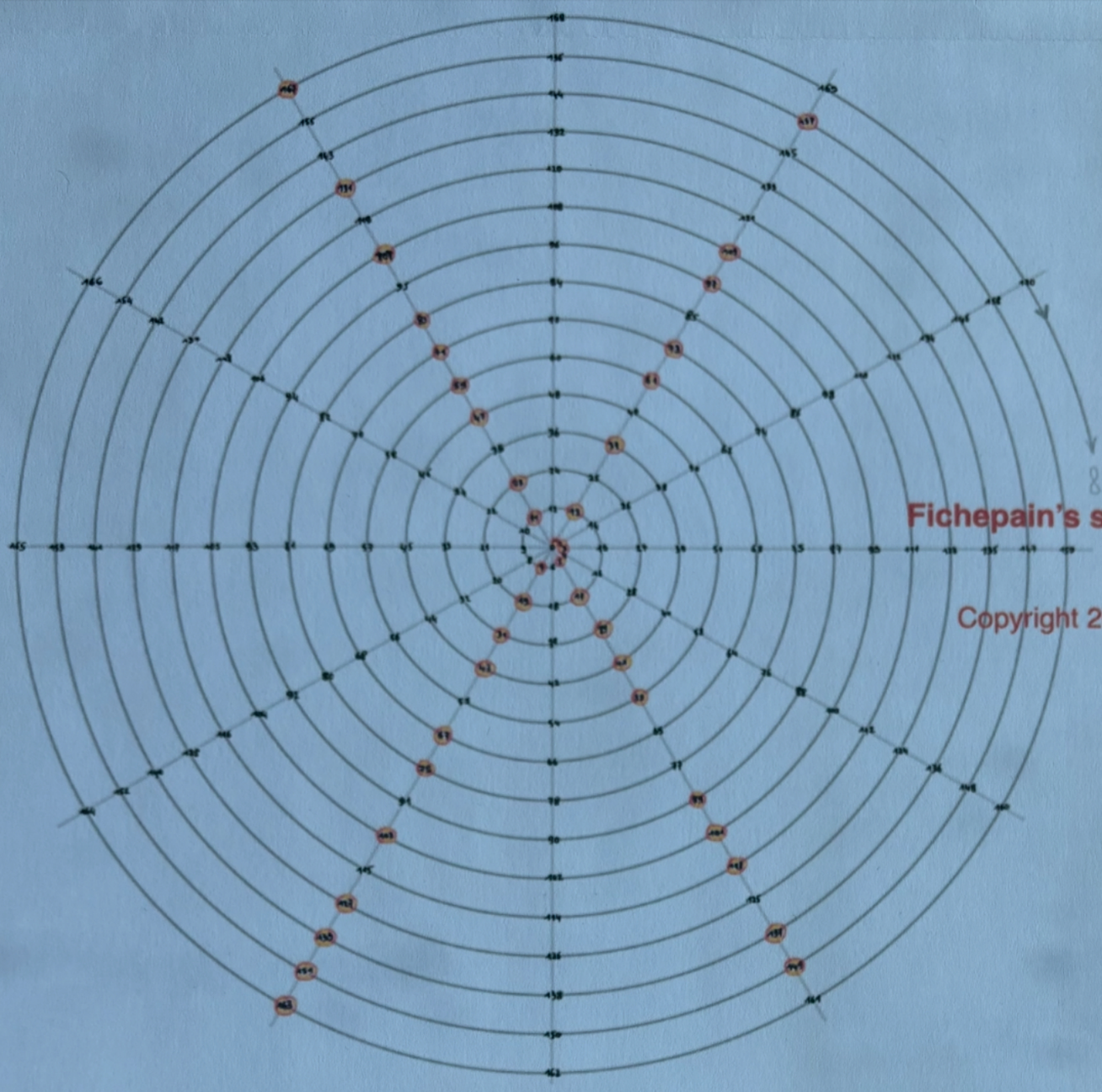


FIGURE 2



Fichepain's spiral

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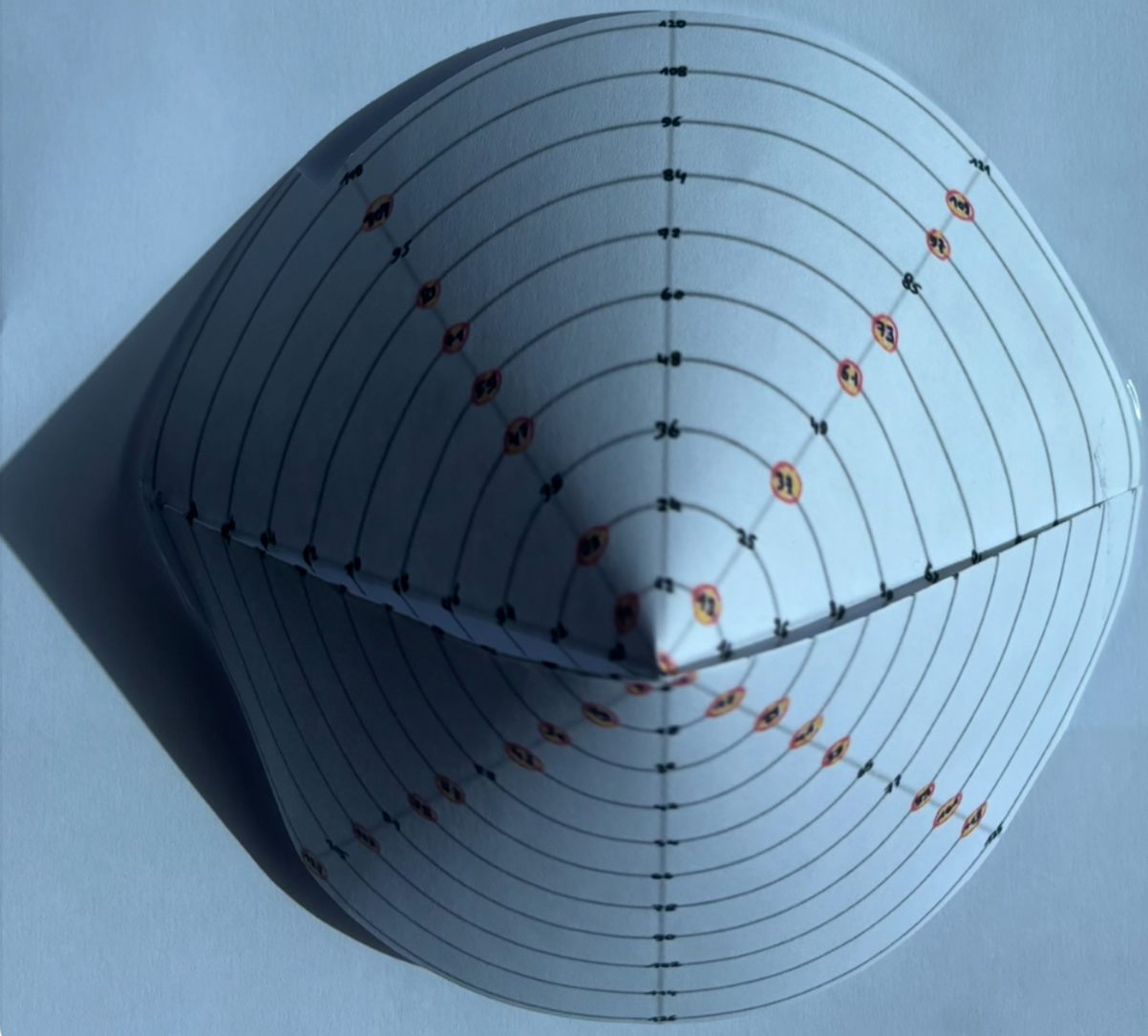

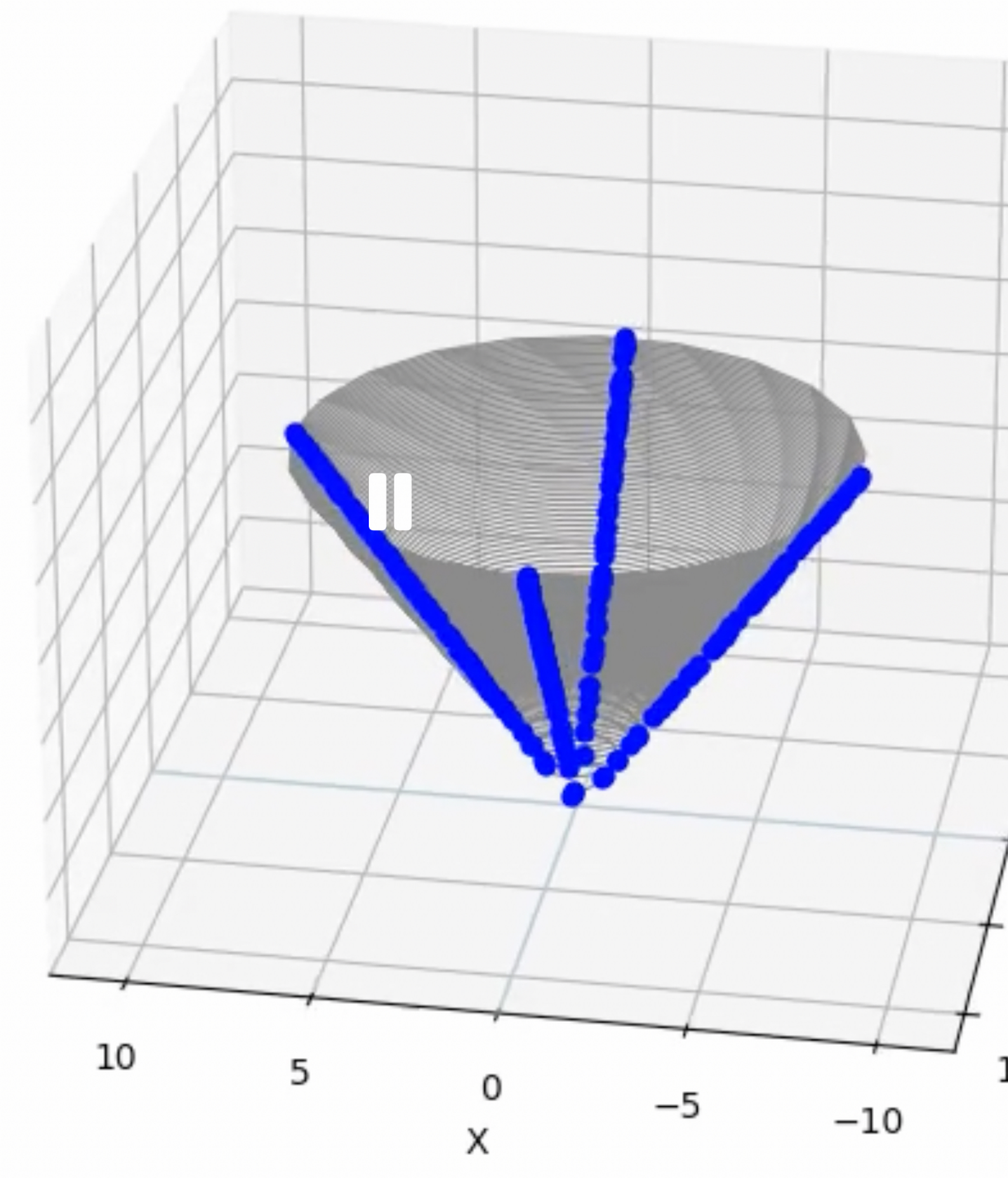
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